

Amendment and Response [Under 37 C.F.R. §1.116 - Expedited Examining Procedure]

Page 2

Serial No.: 09/812,157

Confirmation No.: 2941

Filed: March 19, 2001

For: METHODS FOR PATTERNING METAL LAYERS FOR USE WITH FORMING SEMICONDUCTOR DEVICES

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forming or otherwise depositing a conductive layer (e.g., platinum) on the substrate assembly, the substrate assembly is annealed, causing pooling of the conductive layer on the surface region of the substrate assembly. "Pooling" is described in the specification at page 5, lines 25-29 as "a phenomenon that is believed to be similar to non-wetting of a surface wherein the binding energy of the material deposited (e.g., platinum, ruthenium) is much greater to itself than to the surface to which it is deposited (e.g., silicon, BPSG, etc.) so that "islands" of the deposited material form."

To establish *prima facie* obviousness, three basic criteria must be met. First, there must be some suggestion or motivation, either in the documents themselves or in the knowledge generally available to one of ordinary skill in the art, to combine document teachings. Second, there must be a reasonable expectation of success. Finally, the references, when combined, must teach or suggest all the claim limitations.

As the Office Action admits, Nishioka et al. fails to teach any process that results in pooling of a conductive layer as claimed. Rather, the Office Action asserts that this aspect of the claimed invention is taught by Summerfelt. More particularly, the Office Action asserts that Summerfelt, in "a related method" to form a high dielectric constant capacitor, "teaches a step of forming a single crystal platinum layer, wherein the process includes a step of forming an adhesion layer (64) on an exposed surface; depositing a layer of platinum; and performing an annealing process causing pooling of the platinum on the at least one exposed surface region of the substrate assembly," (*Office Action*, page 3).

Applicant submits, contrary to the Office Action's assertions, that Summerfelt fails to teach pooling of a conductive metal or platinum layer. Rather, the process described by Summerfelt describes a technique used to produce a single grain of oxygen stable material over a barrier layer for the purpose of substantially preventing diffusion of oxygen to the underlying barrier layer. To achieve this goal, Summerfeld describes a process for controlling the nucleation of platinum grains.

**Amendment and Response [Under 37 C.F.R. §1.116 - Expedited Examining Procedure]**

Page 3

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For instance, Summerfelt teaches that recessed TiN plugs on the substrate provide preferential nucleation of platinum, thereby separating nucleation "on" the plug from that "off" the plug. After some platinum nuclei have nucleated on the substrate, the substrate may be annealed to promote Ostwald ripening. During annealing, small platinum nuclei become smaller and eventually disappear, while larger, more stable nuclei grow at the expense of the smaller nuclei. During this process, two small, closely spaced nuclei will rearrange such that only one platinum nucleus remains. See e.g., columns 7-8. The platinum will "nucleate preferentially in the plugs 74 and then establish a depletion zone around the plugs 74," column 7, lines 57-62.

Thus, Summerfelt utilizes an annealing step to form and grow separate platinum areas over the plugs and elsewhere on the substrate surface, e.g., each area is formed of a single crystal. There is no teaching or suggestion that such an annealing step would cause pooling of the platinum on exposed surface regions of the substrate. In fact, Applicant submits that Summerfelt actually suggests the opposite, i.e., that annealing is beneficial to grow large crystalline areas either on the plugs or on the substrate surface, not to cause pooling of the conductive material (platinum) on the exposed surface region. For at least this reason, Applicant submits that claims 58-80 and 83-105 are patentable over Nishioka et al. in view of Summerfelt. Reconsideration and withdrawal of the rejection are therefore requested.

**Claims 81 and 82**

Claims 81 and 82 were rejected under 35 U.S.C. § 103(a) as being unpatentable over Nishioka et al. in view of Summerfelt as applied to claims 58-80 and 83-105, and further in view of DeOrnellas et al. (U.S. Patent No. 6,127,277). Applicant traverses.

As claims 81 and 82 depend from claim 74, each includes the limitations contained therein. As a result, Applicant submits that Nishioka et al. in view of Summerfelt fails to teach each and every element of the claimed invention, e.g., fails to teach pooling of the conductive metal layer. Nothing is identified in DeOrnellas et al. that remedies this deficiency.

**Amendment and Response [Under 37 C.F.R. §1.116 - Expedited Examining Procedure]**

Page 4

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As a result, Applicant submits that claims 81 and 82 are not obvious in view of the cited references. Reconsideration and withdrawal of the rejection are therefore respectfully requested.

**Summary**

It is submitted that pending claims 58-105 are in condition for allowance and notification to that effect is requested. The Examiner is invited to contact Applicant's Representatives, at the below-listed telephone number, if it is believed that prosecution of this application may be assisted thereby.

Respectfully submitted for  
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**CERTIFICATE UNDER 37 CFR § 1.8:**

The undersigned hereby certifies that this paper is being transmitted by facsimile in accordance with 37 CFR § 1.6(d) to the Patent and Trademark Office, addressed to Assistant Commissioner for Patents, Box AF, Washington, D.C. 20231, on this 21<sup>st</sup> day of January, 2003, at 10:15am (Central Time).

By:

  
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